EFFECTS OF WITHIN-STIMULUS AND EXTRA-STIMULUS PROMPTING ON DISCRIMINATION LEARNING IN AUTISTIC CHILDREN¹

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Two different prompting procedures to teach visual and auditory discriminations to autistic children were compared. The first involved presenting an added cue as an extrastimulus prompt. This required the child to respond to both prompt and training stimulus. The second involved the use of a within-stimulus prompt. This consisted of an exaggeration of the relevant component of the training stimulus and thus did not require that the child respond to multiple cues. The results indicated that (1) children usually failed to learn the discriminations without a prompt, (2) children always failed to learn when the extra-stimulus prompt was employed but usually did learn with the within-stimulus prompt, and (3) these findings were independent of which modality (auditory or visual) was required for the discrimination.

DESCRIPTORS: autistic children, discrimination training, fading, prompt, stimulus control, stimulus overselectivity

It has been assumed that autistic children can learn from prompting procedures, but there is no reason to believe that procedures useful in teaching normal children will work with autistic children. Thus, despite reports of successful use of prompts and prompt-fading with autistic children (e.g., Ferster and DeMyer, 1962; Lovaas, Berberich, Perloff, and Schaeffer, 1966; Lovaas, Freitas, Guilani, Nelson, and Whalen, 1967; Metz, 1965; Risley and Wolf, 1967), several studies indicate that serious difficulties might be encountered when using this technique. Several investigators (e.g., Acker, unpublished; Koegel, unpublished; Sidman and Stoddard, 1966) have presented evidence indicating that autistic children often fail to transfer from prompts. Further, in many of the successful reports cited above, the authors reported considerable difficulty in achieving success with the prompt procedure (personal communication).

Recent research in the area of selective attention in autistic children may help to explain why these children do not always show transfer. This research indicates that autistic children have difficulty responding to simultaneously presented cues. Lovaas, Schreibman, Koegel, and Rehm (1971) employed a discrimination learning task in which autistic, retarded, and normal children received reinforcement for pressing a bar in the presence of a complex stimulus involving the simultaneous presentation of a visual, an auditory, and a tactile cue. Once this discrimination was established, elements of the complex stimulus were presented singly on test trials to determine which component had acquired control over the child's behavior. Autistic children characteristically responded to only one of the components. In contrast, normal children responded uniformly to all three cues, while retarded children fell between these extremes. The results were considered to demonstrate "stimulus overselectivity", whereby autistic children are overselective in attention and have trouble learning to respond to stimuli in context. Stimulus overselectivity has also been found when two stimuli (auditory and visual) are employed

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(Lovaas and Schreibman, 1971) and when the stimuli fall within the same modality (Koegel and Wilhelm, 1973; Reynolds, Newsom, and Lovaas, 1974; Schreibman and Lovaas, 1973).

An important implication of stimulus overselectivity is its effect when simultaneous cues are presented in an operant paradigm to shift stimulus control, as in prompting procedures. Since the prompt and training stimulus are presented contiguously or near-contiguously, if a child selectively responds only to the prompt stimulus and not to the training stimulus, then transfer from the prompt should not occur. To investigate the effects of stimulus overselectivity on prompt effectiveness in teaching autistic children, Koegel (unpublished) trained autistic and normal children to bar press in the presence of a red slide and not to press in the presence of a green slide. These colors were then used as prompt stimuli to train four different discriminations. For example, a particular geometric form, designated as the SD was superimposed on the red slide, while a different form, the S^{Δ} , was superimposed on the green slide. The color prompt was then faded (by presenting gradually desaturated color slides) in an attempt to transfer correct responding to the geometric forms. Results indicated that prompt-fading facilitated the discrimination for normal children, but not for autistic children.

The research on stimulus overselectivity reviewed above suggests that autistic children may have an attentional deficit that imposes limitations on the use of prompts. The challenge then, is to develop for such children prompting techniques that work, despite their attentional problems. For example, if autistic children respond to one component of a complex stimulus, then one may be able to use aspects of that component as a prompt, and to attempt to transfer control within that component. That is, autistic children may be very good at discriminating the prompt stimulus, and therefore, if the prompt stimulus could be incorporated within the training stimulus, so that the children did not have to respond to two stimuli, then the children should acquire discriminations relatively easily.

The present investigation was designed with two main purposes in mind. The first goal was to test the effectiveness of a visual prompt (pointing with a finger) to teach discriminations to autistic children. This form of prompt involves providing an added stimulus (prompt) to facilitate the child's response, and thus requires response to multiple cues in an attempt to shift stimulus control. The second goal was more theoretical. This involved relating knowledge of stimulus overselectivity in autism to develop a different form of prompt, which does not require a response to multiple stimuli, and to compare its effectiveness with that of the more traditional prompt.

Specifically, the two procedures used were: (1) provision of an extra-stimulus prompt. This prompt consisted of an added stimulus to guide the child's response. This is a common form of prompt and was the kind used by Koegel (unpublished), whose data suggest that this kind of prompt is not effective with autistic children. (2) Provision of a within-stimulus prompt. This prompt was the relevant part of the training stimulus and thus required response to only one (relevant) stimulus. On the basis of the research discussed, it may be expected that an autistic child provided with an extra-stimulus prompt on a difficult discrimination task would respond selectively to that prompt and fail to learn the training stimuli. However, if a prompt was provided that fell within the relevant component of the training stimulus itself, then one would not expect the prompt to block the child's response to the training stimulus, but that the child would be learning about the training stimuli, and be able to transfer to them.

The general procedure can be summarized as follows: a single-subject design was employed where six autistic children were each trained on four difficult discrimination tasks. Two of the tasks involved visual stimuli (forms on cards) and two involved auditory stimuli (two-syllable nonsense words). Initially, subjects received training on the discriminations without a prompt to determine if they could learn without it. In those

cases where the discrimination was not learned. the subject was presented with the prompting procedures. The order of prompting conditions (within- or extra-stimulus) was randomized such that each subject received both orders of prompting conditions in each modality. For the extrastimulus prompt, subjects were first trained to respond to the prompt stimulus; once this response was established, the prompt stimulus was gradually faded in an attempt to transfer control to the training stimuli. For the within-stimulus prompt condition, that part of the training stimuli essential to the discrimination was exaggerated and then faded. Three subjects began with the visual discriminations and three began with the auditory discriminations. Thus, each subject completed the discriminations in one modality before beginning the tasks in the other.

METHOD

VISUAL DISCRIMINATIONS

The effectiveness of two prompting techniques for training visual discriminations was assessed by training subjects on two difficult visual discrimination tasks, using forms drawn on blank cards as stimuli. On each task, subjects were initially trained without prompts. If they failed to learn, they were trained on the same tasks, but with the two prompt-fading procedures. The extra-stimulus prompting procedure involved the gradual fading of a pointing prompt, the within-stimulus prompt procedure involved (a) emphasizing the stimulus component relevant to the discrimination between S+ and S—, and (b) fading by gradually reducing the emphasis on the relevant component.

Subjects

Six autistic children (four boys and two girls), inpatients at the Children's Treatment Center at Camarillo State Hospital, Camarillo, California, ranged in age from 8.6 to 14.0 yr (X = 11.3). All subjects were diagnosed as autistic by agencies not associated with this study, and were severely

psychotic, displaying little, if any, appropriate verbal behavior. Four subjects were mute or uttered only meaningless sounds, another displayed echolalic speech of a noncommunicative nature, and the sixth child had echolalic speech used occasionally to communicate. All subjects, showed absent or minimal social and self-help skills, and displayed much self-stimulatory behavior (stereotyped arm and hand movements, rhythmic rocking, spinning, etc.). They were variable in their responsiveness to external stimulation, such that four had histories of suspected, but unconfirmed deafness or blindness.

The children chosen for this study showed severe behavioral deficits because it was felt that they would permit a more clear-cut analysis of perceptual dysfunction. It is possible that autistic children with less-severe deficits might have performed differently.

Apparatus

Each of the two tasks included two stimuli. S+ and S-, differing in only one relevant characteristic. The stimuli consisted of black line forms centered on white 4- by 6-in. (10 by 15 cm) cards. The S+ stimulus appeared on half of the cards, the S- stimulus on the others. Several cards (of each stimulus) were used and alternated to prevent the subject from solving the discriminations on the basis of an irrelevant, idiosyncratic feature of a card. One stimulus set consisted of an "X" measuring 1.75 by 1 in. (4.4 by 2.5 cm) centered on the card. On half of the cards, a 0.125-in. (0.32 cm) diameter dot was placed 0.25 in. (0.64 cm) above and another dot 0.25 in. (0.64 cm) below the intersection of the legs of the X. On the other half of the cards, the dots were placed 0.25 in. (0.64 cm) to the left and 0.25 in. (0.64 cm) to the right of the intersection. These stimuli are presented in Figure 1. The second stimulus set consisted of a stick figure measuring 3.25 in. (8.3) cm) in height with head, trunk, and arms. On half of the cards, both arms of the figure were in a lowered position, forming 45° angles with the trunk. On the other half of the cards, the

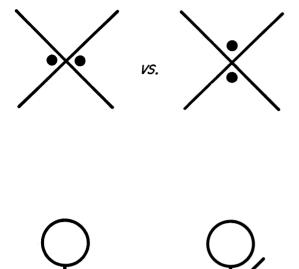


Fig. 1. Task stimuli used for the visual discrimina-

VS.

right arm was raised, forming a 135° angle with the trunk, as shown in Figure 1.

These stimuli were chosen because they were felt to be representative of those the child is likely to encounter in everyday life. For example, the discrimination between stick figures is similar to difficult visual discriminations between many written symbols, such as "E" versus "F". The more "real" symbols, such as letters, were not used because it was necessary to ensure that the subjects would not have experience or training with the stimuli outside the experimental situation.

Three subjects were randomly assigned to a female experimenter and the remaining three to a male experimenter. The subject and the experimenter sat facing each other across a small table. From this position, the experimenter was able to present the stimuli directly in front of the subject and within his reach. During each task, the subject was presented simultaneously with the S+ and S- stimuli and trained to respond by pointing to the S+ card. The device designed for the fading of the extra-stimulus

prompt is presented in Figure 2. It was cut from 0.5 in. (1.25 cm) plywood. The side facing the subject had a raised lip from points C to D and E to F. This was to ensure placement of the stimuli in the same position on each trial. The stimuli were placed in the positions indicated by points C, D, H, I, and K, J, E, F. Points B and G represent the position of the experimenter's finger for a full prompt and were located at the upper center edge of the card stimulus. Point A represents the no-prompt position. Here, the pointing prompt was exactly midway between the two stimuli. The distance between points B (or G) and A was divided into 32 fading steps. The experimenter could manipulate the strength of the prompt by moving his/her finger along the line B (or G) to A (the side on which the prompt was presented depended on the position of the S+ card). The smallest fading step used was 1/32nd of the distance from B (or G) to A. This distance corresponded to 11/32 in. and was the smallest fading step possible due to the width of the prompt (finger). The prompt was thus withdrawn in two dimensions, distance from the cards (toward the experimenter) and toward the midpoint between the two cards.

Procedure

Each subject was presented with both orders of the prompting procedures, *i.e.*, for one task, the subject was presented with the training without prompt, followed by the extra-stimulus prompt and then the within-stimulus prompt; for the second task, the order of prompting conditions was reversed. This allowed the effectiveness of the different prompting procedures to be investigated independent of order of presentation. To control for possible differences in task difficulty, the order of the tasks and the choice of S+ on each task was randomized across the subjects. All subjects were tested in 20- to 40-min sessions no more than twice a day nor less than once every three days.

Pretraining on the extra-stimulus prompt. Since, by definition, a prompt stimulus serves to guide the subject's response, it was necessary to

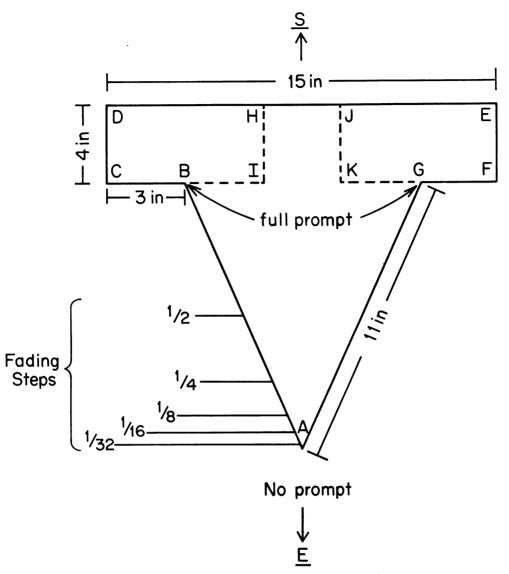


Fig. 2. Measured device used for fading the extra-stimulus prompt. The device was placed on the table between the subject and experimenter. The stimulus cards were placed in the rectangles near subject. Experimenter faded the pointing prompt by moving her finger from point B (or G) toward point A, according to the specified fading steps.

establish the pointing stimulus as a functional prompt. All subjects were therefore first trained to respond to a pointing prompt by the following procedure. The experimenter placed two blank unlined 4 by 6 in. (10 by 15 cm) cards directly in front of the subject and within his easy reach. The experimenter pointed to one of the cards and asked the subject to "point to the correct card". If the subject failed to respond, the experimenter moved the subject's hand toward the

card at which the experimenter was pointing. This manual prompt was gradually eliminated until the subject responded on his own. The subject received reinforcement for correct responses with verbal praise ("good") and a food reinforcer (piece of cookie, candy, raisin, etc.). Incorrect responses were followed by a loud "no" and immediate removal of the cards. These consequences were used throughout the study. Failure to respond was scored as an error. Train-

ing continued until the subject responded correctly to the pointing prompt on 10 consecutive trials.

Training without prompt. After pretraining on the extra-stimulus prompt, training began on one of the two discriminations. On each trial, the experimenter placed the two stimuli of the task (S+ and S-) simultaneously in front of the subject and asked him to "point to the correct card". If necessary, the response was manually prompted by the experimenter, who moved the subject's hand toward the correct card. This was done until the subject would point to a card without the experimenter's aid. During each task, the position of S+ and S- was determined by a Gellerman (1933) alternation order to prevent the subject from forming a position discrimination. The criterion for learning a task in this stage was 90% or more correct responses in any block of 20 trials. To control for the possibility that the subjects might learn the tasks without a prompt if given many more trials, four randomly chosen subjects received 60 trials on each task and the two remaining subjects received 200 trials, in both cases without prompts, on each task. If the subject learned the task during this training phase, he was exposed to the extra-stimulus prompt fading condition to determine if he could retain the discrimination when this added stimulus (the prompt) was introduced. If the subject did retain the discrimination, training on this task was terminated. If the subject did not learn the task after his allotted number of trials, he was considered a nonlearner and the experimenter proceeded to the next stage of the experiment. Also during this stage, the schedule of delivery of food reinforcement was gradually changed from reinforcement for every correct response to a variable schedule in which, on the average, every fifth correct response was reinforced. Verbal praise was delivered after every correct response. This schedule remained in effect throughout the rest of the study for the visual discriminations.

Extra-stimulus prompt fading. During this stage, training continued as before, except that

now on each trial the experimenter presented a pointing prompt with the S+ stimulus, using the device described earlier in Figure 2. That is, the cards were placed in position and the experimenter began by pointing to the upper center edge of the S+ card on each trial. The experimenter faded this prompt by moving her/his finger along steps marked off on the sides of the fading device.

The subject first received trials with the pointing prompt at full level. When he performed correctly with the prompt on 10 consecutive trials at this level, the pointing prompt was gradually removed in a modified back-up fading procedure (Holland, 1961). The subject always received five trials at each prompt level unless he made an error. This ensured that the subject was responding correctly at a prompt level before he was advanced to a more difficult level. During this back-up procedure, if the subject responded correctly at a given prompt level, he was advanced to a smaller prompt level. If the subject erred, he was immediately backed up to the previous prompt level at which he responded correctly. After five correct trials at this level, he was advanced to a level halfway between the level at which he was correct and the level at which he was incorrect. If the subject was correct at this level, he was advanced to the next fading step. Using this procedure, the size of the first fading step was arbitrary, and the first step was to remove the prompt (the experimenter moved his/her finger to the position at the end of the device). This served to determine if there was any transfer from prompt to training stimulus when the prompt was abruptly removed. It also allowed assessment of the largest fading step that would produce transfer. Thus, every time the subject made an error he was backed up to a level where he could respond correctly, then he was advanced again, but this time in a step half as large.

The fading procedure on a given task was continued until the subject either transferred (performed correctly with no prompt for 10 consecutive trials) or until he failed to transfer at

the smallest fading step (11/32 in.) after attempts at two consecutive blocks of five trials.

Within-stimulus prompt fading. The stimuli employed during this stage were identical to those used in the other stages, except that during the initial phases of within-stimulus training, the experimenter employed only that component of each discrimination that was crucial to the differentiation between S+ and S—. This component was expanded or exaggerated and served as the within-stimulus prompt. Thus, in the discrimination involving the Xs and the dots, the position of the dots on the S+ stimulus was emphasized; in the discrimination involving the stick figures, the arm position was emphasized. The fading steps are presented in Figure 3 and can be described as follows:

- (1) Fade in S-. During this phase, the critical component of the discrimination was enlarged or expanded on the S+ stimulus to maximize its discriminative properties. This expanded S+ stimulus remained unaltered during this first phase of fading. At the beginning, the S- card was blank and subject responses to the S+ card were reinforced. After the subject performed correctly on the S+ versus blankcard discrimination (Step 1, Figure 3, Part 1), he was advanced to the next step, which involved presenting the S- critical component enlarged in the same manner as S+, but at a very faint intensity. Gradually, as the subject progressed along the fading steps, S- was made increasingly dark until it matched in intensity the S+ stimulus (Steps 2 through 5, Figure 3, Part 1).
- (2) Fade-out size and position prompts. In this phase, the size of the critical components on both S+ and S- stimuli were gradually reduced to the size presented on the regular (final) task stimuli. The position of the stimuli on the cards was also adjusted to that represented on the original stimuli. (Steps 1 through 5, Figure 3, Part 2).
- (3) Fade-in redundant components. Now, the remaining (or redundant) components of the stimuli were gradually faded-in, while the previously faded critical components remained un-

altered (Steps 1 through 5, Figure 3, Part 3) until the subject was presented with the original training stimuli. Criterion for learning was 10 consecutive correct trials on these stimuli.

A back-up fading procedure, as was used with the extra-stimulus prompt, was unsuitable for the within-stimulus prompt, because it would have required re-introduction of the training stimulus early in fading. Since introduction of the redundant cues might have interfered with the subject's response to the relevant component, the purpose for the within-stimulus prompt would have been defeated. Thus, a different fading procedure was used. There were five prearranged fading steps within each phase. When the subject responded correctly on five consecutive trials at a given fading step he proceeded to the next. If he made an error, he was backed up to the previous step for another five consecutive correct trials. If the subject erred when advanced to the next step for the second time, he was again backed up to the previous step. At this time, the next step was broken down into half steps to facilitate the subject's progress to the next step. It was potentially possible for any step shown in Figure 3 to be broken down into as many as five part steps. If the subject failed to transfer, after two attempts, on the smallest fading step possible he was considered a nonlearner on that task and training on that task was terminated. Criterion for learning with the within-stimulus prompt was 10 consecutive responses with no prompt.

In those instances where the subject learned the task with the within-stimulus prompt before being exposed to the extra-stimulus prompt, the extra-stimulus prompt condition was presented anyway to determine if the subject could maintain the discrimination when the added cue (pointing prompt) was introduced.

AUDITORY DISCRIMINATIONS

This part of the experiment investigated the effectiveness of two prompting techniques for training auditory discriminations to autistic children. The subjects were trained on two difficult

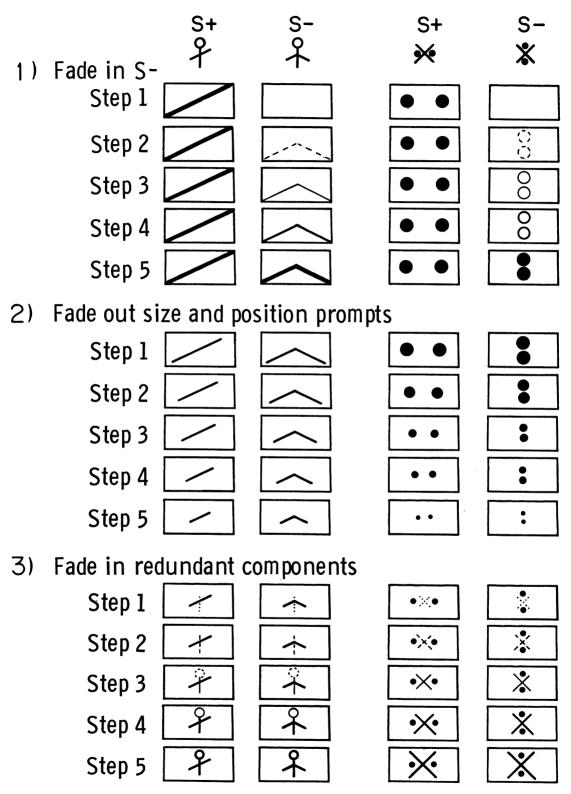


Fig. 3. Fading steps for the within-stimulus prompt procedure on the visual discrimination tasks.

auditory discriminations. The task stimuli were two-syllable nonsense words. The procedure was analogous to that used for the visual discriminations. That is, on each task the subjects initially received training without a prompt. If they did not learn, they were trained on the same tasks, but with the two prompt-fading procedures. The extra-stimulus prompt procedure involved presentation and gradual fading of a buzzer prompt. The within-stimulus prompt procedure involved emphasizing the stimulus component relevant to the discrimination between S+ and S—. This prompt was faded by gradually reducing the emphasis on the relevant component.

Apparatus

All subjects were trained on two discrimination tasks. Each employed two verbal stimuli, S+ and S-, differing in only one relevant characteristic. The stimuli were two-syllable nonsense words recited by the experimenter and recorded on four-track audio tape for playback on a Roberts Model 610X stereo tape recorder. The experimenter operated the recorder by remote control. The two discriminations were: (1) magōō versus magō, and (2) nolē versus nolā.

Four tapes were employed. The tapes differed on the basis of task and S+ stimulus (e.g., nolä versus nolē with nolā S+, nolā versus nolē with nolē S+). For pretraining on the extra-stimulus prompt, 1-sec bursts of a standard 6-V household door buzzer were recorded on the first section of each tape for playback at 60 dB. (These and all measures were made with a General Radio Company Sound Level Meter, type No. 1551-B at a distance of 4 ft (1.2 m) from the speakers, which was the approximate position of the subject's head.) For the no-prompt training stage, the S+ and S- stimuli were recorded for presentation in a Gellerman alternation order and of equal intensity for playback at 80 dB. For the extra-stimulus prompt fading stage, the buzzer was recorded simultaneously with the S+ stimulus, but on the second track of the recording tape. Independent volume control for the two tracks enabled the experimenter to fade

the buzzer by decreasing the volume on the second track while leaving the first track unchanged. The within-stimulus prompt fading stage necessitated recording the stimuli in such a way that the first syllable was recorded on the first track of the tape and the second syllable was recorded immediately following on the second track. Thus, when the two tracks were played simultaneously, the two-syllable stimulus sounded as one word. With this arrangement, the intensity of the individual syllables was independently manipulated for the fading procedure.

The stimuli were presented through a speaker located next to the experimenter and 4 ft (1.2 m) in front of the subject. A box measuring 14 by 9.5 by 5.5 in. (35.5 by 24.1 by 13.9 cm) holding a 5-in. (7.5 cm) bar was directly in front of the subject and within his easy reach. The subject was trained to press the bar when the S+ stimulus was presented and to refrain from pressing when the S- stimulus was presented. The subject sat at a small 2.5-ft (0.75 m) high table across from the experimenter, who reinforced correct responses with verbal praise ("good") and food reinforcers.

The auditory stimuli were chosen because it was felt that they were representative of linguistic discriminations that children learn. The stimuli employed here seem comparable to verbal discriminations involving words with a common root, but differing in prefix or suffix (e.g., "running" versus "runner"). Real words were not used because of the desire to ensure that the subjects would not have any experience or training with the stimuli outside of the experimental situation.

Unlike the visual pointing prompt, no typical auditory extra-stimulus prompt could be found for these discriminations. It is possible that the buzzer was an unusual sound and led to particular results for that reason.

Procedure

As with the visual discriminations, each subject received both orders of the prompting pro-

cedures. The order of the tasks and the choice of S+ on each task were randomized across subjects. All subjects were given 20- to 40-min sessions of no more than two a day nor less than one every three days.

Pretraining on the extra-stimulus prompt. All subjects were trained to respond to the extrastimulus prompt (buzzer). The experimenter presented that section of the tape containing the 1-sec bursts of the buzzer. Each time the buzzer sounded, the experimenter manually initiated the correct response by putting the subject's hand on the bar and reinforcing the response. The intertrial interval was 10 sec. This continued until the subject initiated the response on his own. Responses made in the absence of the buzzer were followed by a loud "no". This consequence remained in effect throughout training on the auditory discriminations. Correct responses were those occurring within 5 sec after the buzzer terminated. Failure to respond within this interval or responses at any other time were scored as errors. Criterion for learning at this stage was 10 consecutive correct responses.

Training without prompt. Following the pretraining, training began on the two discrimination tasks. The subject was presented with the S+ and S- stimuli of the task in a Gellerman alternation order. The subject received reinforcement for pressing the bar when the S+ stimulus was presented. The experimenter manually prompted the first several trials to instigate the subject's responding. Pressing the bar at other times, or failing to press within 5 sec of S+ termination, were considered errors and were not reinforced. The intertrial interval was 10 sec. The criterion for learning a task at this stage was 90% or more correct responses in a block of 20 trials. If the subject reached criterion on a task, he was exposed to the extra-stimulus prompt fading condition to determine if he could retain the discrimination when the stimulus was added. If the subject did retain the discrimination, training on this task was terminated for the remainder of the experiment.

As with the visual discriminations, to control for the possible effect of different amounts of training on learning the discriminations, four subjects received 60 trials on each task and two subjects received 200 trials on each task. The subjects receiving 200 trials were not the same as those that received 200 trials on the visual discrimination. If the subject did not learn the task after his specified number of trials. he was considered a nonlearner and proceeded to the next stage of the experiment (extra- or within-stimulus prompting). Also during this stage, the schedule of delivery of food reinforcement was decreased from reinforcement for each correct response to a variable schedule in which. on the average, every fifth response was reinforced. Verbal praise was delivered after each correct response. This schedule remained in effect throughout the rest of the study for the auditory discriminations.

Extra-stimulus prompt fading. During this stage, training continued as before except that now the buzzer (prompt), which had been pretrained, was presented simultaneously with the S+ stimulus. After the subject responded correctly on 10 consecutive trials at the full-prompt level, fading of the prompt began. The buzzer prompt was faded by systematically lowering its volume on the single track on which it was recorded. The procedure for fading the prompt was the same back-up technique described for the visual discriminations. A minimum of eight pre-arranged fading steps (each corresponding to a specific buzzer intensity) were used. The steps were: full (70 dB), $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, $\frac{1}{16}$, $\frac{1}{32}$, and 0. These steps were set by reducing the decibel level by 6 dB, which was judged subjectively to be half as loud as the previous step. Thus, the decibel levels corresponded to 70, 64, 58, 52, 46, 40, and 0. The subject's failure to transfer to any given step resulted in further reducing the critical intervals by halves. The smallest fading step for any given interval was 1/32. Criterion for failure was two consecutive incorrect responses at the smallest fading step. Criterion for learning was 10 consecutive correct trials with no prompt.

Within-stimulus prompt fading. As with the visual discriminations, the stimuli employed during this stage were identical to those used in the preceding stages, except that the experimenter did not employ the entire stimuli during the initial phases of fading. Since the last syllable of the two-syllable nonsense words was the only component on which discrimination between S+ and S- was possible, this component was emphasized and used as the within-stimulus prompt. For example, when training magoo versus mago, the within-stimulus prompt consisted of presenting only the relevant components (gōō versus gō) and emphasizing the difference between them. Once this discrimination was established, the redundant component (ma) was faded-in. All fading procedures were accomplished by manipulating the volume on the independent tracks of the tape on which the stimuli were recorded. The fading steps were as follows:

(1) Fade-in S—. During this phase, the critical component (second syllable) of the discrimination was presented on the S+ stimulus and de-emphasized on the S— stimulus. The first syllable was absent for both stimuli. At first, the second syllable of the S+ stimulus (e.g., "gōō") was presented at normal length and intensity (80 dB), while the second syllable of S— (e.g., "gō") was absent (meaning that S— at this point was silence). The subject received reinforcement for responding to S+ and not for responding at any other time. As the subject progressed along the fading steps, S— was gradually increased in intensity until it matched the intensity of S+.

(2) Fade-in redundant component. When the subject could correctly discriminate between the last syllable of the S+ and S- stimuli, the redundant first syllable was gradually faded-in simultaneously for both S+ and S-. This was accomplished by systematically increasing the intensity of the first syllable until it matched the intensity of the second syllable.

The subject was required to make five con-

secutive correct responses before advancing to the next fading step. There were six pre-arranged fading steps in the first phase of fading. These steps were derived by dividing the audible range between 80 dB and inaudible, into five intervals judged to be subjectively equal by five normal adults. These intervals corresponded to 80, 70, 60, 50, 40, and 30 dB (30 dB was inaudible). There were five pre-arranged steps in Phase 2 of this procedure. They were also judged to be subjectively equal and they corresponded to 40-, 50-, 60-, 70-, and 80-dB levels. If the subject erred on a fading step, he was backed up to the previous fading step at which he was correct. If the subject again failed to transfer to the next step, the step was broken down into half steps. It was potentially possible for any of the predetermined intervals to be broken down into as many as five part steps. If, after two attempts, the subject failed to transfer on the smallest fading step possible, he was considered a nonlearner on that task and training on that task was terminated. Criterion for learning was 10 consecutive correct trials with no prompt.

In those instances where the subject learned the task with the within-stimulus prompt before being exposed to the extra-stimulus prompt, the extra-stimulus prompt condition was presented anyway to determine if the subject could maintain the discrimination when the added cue was introduced.

Reliability

Although it may be obvious that discrete data as obtained here could be recorded by the experimenter, five additional reliability sessions were conducted as an additional check. A naive observer seated in an adjoining room and observing through a one-way mirror recorded if the subject's responses were correct or incorrect. These reliability sessions were conducted randomly across subjects, conditions, and modalities. On all five reliability sessions, the observer was in 100% agreement with the experimenter.

RESULTS

Acquisition of Discriminations Without a Prompt

There were 24 discriminations involved (four per subject). Only eight were learned without prompts. Thus, some form of prompting was, in general, needed for the subjects to acquire the discriminations. It is important to note that although prompts were needed for the subjects to learn, some learning did occur without the use of prompts. Thus, five of the six subjects learned at least one of the discriminations without a prompt. One subject learned three, another learned two, and three subjects learned one each. Mastery on one of the tasks did not predict the subject's performance on the other tasks.

Learning that took place without prompts was independent of modality, *i.e.*, half the discriminations learned were visual and half auditory.

The number of training trials the subject received without a prompt did not prove to be a significant factor in facilitating learning. Provision of 140 more trials did not lead to better acquisition than when the subject was allowed only 60 trials. If learning was to take place, it occurred within the first 60 trials.

Differential Effects of Extra-Stimulus and Within-Stimulus Prompts

Those tasks that had not been learned previously in a particular condition were considered "unlearned tasks". As can be seen in Table 1, the extra-stimulus procedure was unsuccessful each of the seven times it was applied to unlearned tasks (Michael, first task; Jeffrey, first and fourth tasks; Marty, first and fourth tasks; Ruby, first task; Kurt, third task). This was the case whether the task was "familiar" (second task) to the subject or not (first task). On the other hand, the within-stimulus procedure was successful 15 of the 16 times it was applied to unlearned tasks. (It was unsuccessful on the third task with

Kurt). This difference is highly significant (p < 0.001) when tested by Fisher's Exact Probability Test. The two prompting conditions were used a different number of times, since if a discrimination was already learned (with the within-stimulus prompt or without prompt), the extra-stimulus procedure was introduced to determine if the subject could retain the discrimination when the cue was added. The within-stimulus prompt procedure, however, was never presented after a discrimination had already been learned.

The extra-stimulus prompt was introduced after a task had been previously learned on 17 occasions (see Table 1). On six of these occasions, the subject's performance on the discrimination was disrupted, as evidenced by the occurrence of at least one error during the extra-stimulus procedure. That is, although the subject had performed at criterion level before the extra-stimulus prompt was introduced, this prompt caused at least one error sometime during training when subsequently introduced. Of these six cases, three proved to be so disrupted that the discrimination was lost completely and could not be re-established using the extra-stimulus prompt. These three discriminations represent the performances of three different subjects, indicating that the difficulty in retaining prior discriminations when the extra cue was added was not exclusive to one particular child.

It may be interesting to see which steps in the within-stimulus fading procedure proved most difficult for the subjects. Looking at the subjects as a group, most problems (i.e., difficulty in progressing to the next step) occurred (1) where the S+ and S— stimuli approached equal intensity during the first phase of fading, and (2) at the beginning of the last fading phase when the redundant component was introduced. For the visual discriminations, these fading steps corresponded to Phase 1, Steps 3, 4, and 5, and Phase 3, Steps 1, 2, and 3. For the auditory discriminations, these fading steps corresponded to Phase 1, Steps 4, 5, and 6 and Phase 2, Steps 1, 2, and 3.

Table 1

Condition order and learning record for the individual subjects. Reading across the table, the subject's name is followed by the modality of the task presented, the S+stimulus of that task, the number of trials allotted without prompt, and the prompt conditions in the order they were presented.

		Number Trials Without Prom						
Subject	Experiment	Task S+	Learned (+) Not Learned (-)		Learned (+) Not Learned (-)			
Michael	٧	※	200	-	Extra	(-)	Within	(+)
	V	*	200	-	Within	(+)	Extra	(+)
	Α	magōō	60	-	Within	(+)	Extra	(+)
	Α	nolē	60	+	Extra	(+)		
Jeffrey	٧	↑	200	-	Extra	(-)	Within	(+)
	V	*	200	-	Within	(+)	Extra	(-)
	Α	nolä	60	+	Extra	(+)		
	Α	magō	60	-	Extra	(-)	Within	(+)
Marty	٧	አ	60	-	Extra	(-)	Within	(+)
	V	*	60	-	Within	(+)	Extra	(-)
	Α	nolē	200	-	Within	(+)	Extra	(+)
	Α	magō	200	-	Extra	(-)	Within	(+)
Ruby	Α	magōō	60	-	Extra	(-)	Within	(+)
	Α	nolē	60	-	Within	(+)	Extra	(-)
	V	※	60	-	Within	(+)	Extra	(+)
	V	%	60	+	Extra	(+)		
Kurt	A	magōō	200	-	Within	(+)	Extra	(+)
	Α	nolä	200	+	Extra	(+)		
	V	*	60	-	Extra	(-)	Within	(-)
	V	¥	60	+	Extra	(+)		
Marni	Α	magō	60	-	Within	(+)	Extra	(+)
	Α	nolä	60	+	Extra	(+)		
	٧	አ	60	+	Extra	(+)		
	V	*	60	+	Extra	(+)		

Effects of Modality on Results of Prompting Procedures

In general, the results indicate that the withinstimulus prompt procedure was effective in both modalities. The extra-stimulus prompt procedure was never successful when introduced in unlearned tasks, regardless of modality.

Analysis of Single-Subject Data

The data for two of the subjects, Marty and Jeffrey, conform closely to the general trends reported earlier, and are presented in detail to illustrate the procedures used and the kinds of behavior observed. Marty's and Jeffrey's acquisition curves for the no-prompt, extra-stimulus prompt, and within-stimulus prompt conditions are plotted in Figures 4 through 7.

Marty on visual discriminations. Marty's data on the visual discriminations are plotted in Figure 4. The figure shows the data on two discriminations. The discrimination involving the stick figures is shown in the upper half, and the discrimination involving the Xs with the dots is shown in the lower half. S+, the stimulus that was correct for each discrimination is indi-

cated on the left side of the figure. Part 1 in the figure shows the subject's performance on the discrimination when no prompt was provided. Per cent correct response appears on the ordinate and blocks of 20 trials appear along the abscissa. It can be seen that Marty did not learn the discriminations without a prompt. His responses all fall within chance level.

Parts 2 and 3 in the figure show the data for the two prompting conditions in the order they were presented. In the upper half of Figure 4, Part 2 shows his performance when the extrastimulus prompt was added. The size of the fading step is presented on the ordinate. Blocks of trials are plotted along the abscissa. A "C" indicates a block of five consecutive correct responses. An "I" indicates an incorrect trial occurred before five correct responses. (If the subject erred, he was returned to the prompt

level where he was last correct.) As can be seen in the figure, Marty did not transfer to the ½ prompt level even after the fading steps were as tiny as physically possible, as can be seen in his failure to transfer during blocks 24 to 28.

His performance on the discrimination of the stick figures using the within-stimulus prompting procedure is presented in the upper half, Part 3. This graph is plotted in a similar manner as the extra-stimulus procedure. The fading steps are presented on the ordinate by double numbers. The first number refers to the phase of fading; the second number indicates the fading step within the phase. (These steps correspond to those in Figure 3.) As can be seen in the figure, Marty learned with the help of the within-stimulus prompt procedure. He had some difficulty when the redundant stimulus component was introduced (Phase 3, Steps 1 and 2).

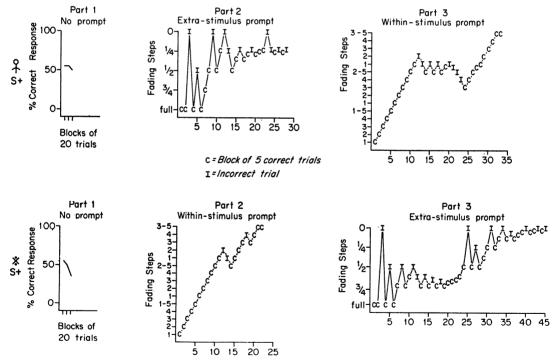


Fig. 4. Marty's data on the visual discriminations. The upper half of the figure shows the subject's performance on the first visual task, the lower half of the figure shows his performance on the second visual task. Task S+ stimuli are presented on the left. Part 1 of each task presents the subject's performance during the no-prompt condition. Blocks of trials appear on the abscissa and per cent correct responses on the ordinate. Parts 2 and 3 show the data for the prompt conditions in the order they were presented. Blocks of trials are presented on the abscissa and fading steps on the ordinate. A "C" indicates a block of five correct responses. An "I" indicates an error occurred before five correct responses.

The second visual task, the Xs with the dots, is presented on the lower half of Figure 4. As can be seen, Marty learned this task quickly (by the twentieth block) using the within-stimulus prompt. Again, some difficulty was encountered when the redundant stimulus component was faded-in (Phase 3, Steps 1 and 2).

When the extra-stimulus prompt was introduced (Part 3, lower half of figure) performance was severely disrupted, even though this discrimination had already been mastered. He was unable to recover the discrimination using the extra-stimulus prompt, although he faded to the smallest fading step possible (trial blocks 42 to 44).

Marty on auditory discriminations. Marty's data on the auditory discriminations are presented in Figure 5. His performance on the first task (nolē versus nolä) is presented in the upper half of the figure and his performance on the second task (magō versus magōō) in the lower half. As can be seen in Part 1 of the figure, he failed to learn either task when trained without a prompt, despite 200 trials on each. Results of the within-stimulus prompt procedure on the first task (upper half of figure, Part 2) indicate difficulty progressing along the steps, as well as a general decrement in responding, possibly due to a lack of motivation (he was refusing to accept the reinforcers). When this motivational prob-

lem was alleviated, by switching to another reinforcer during the ninety-second trial block, he acquired the discrimination. (This tactic of switching reinforcers to bolster motivation was typically used when a subject appeared to be failing due to lack of incentive. It was used in some cases during within-stimulus prompting and in other cases during extra-stimulus prompting.)

Introduction of the extra-stimulus prompt (upper half, Part 3 in Figure 5) led to an initial loss of the discrimination, as can be seen during the first 10 trial blocks. After some additional difficulty, the subject recovered the discrimination (trial blocks 29 through 34).

On the second auditory task (magō versus magōō) when the extra-stimulus prompt was used (Part 2 in figure), the subject was unable to transfer beyond even the ½ prompt level (trial blocks 17 to 20). When the within-stimulus prompt was presented (Part 3 in figure) the subject had some difficulty when the relevant stimulus components approached equal intensity (Phase 1, Step 6, trial blocks 5 to 25) but did acquire the discrimination.

Jeffrey on visual discriminations. Jeffrey's data on the visual discriminations are plotted in Figure 6. As can be seen in Part 1 of the figure, he failed, after 200 trials, to learn either of the visual discriminations. When the extra-stimulus

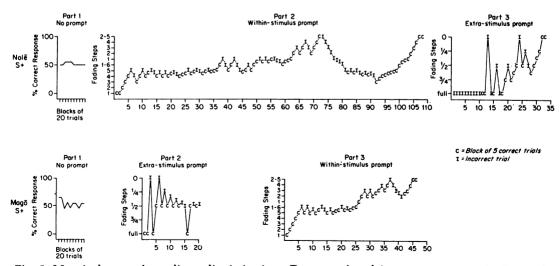


Fig. 5. Marty's data on the auditory discriminations. Data are plotted in same manner as in Figure 4.

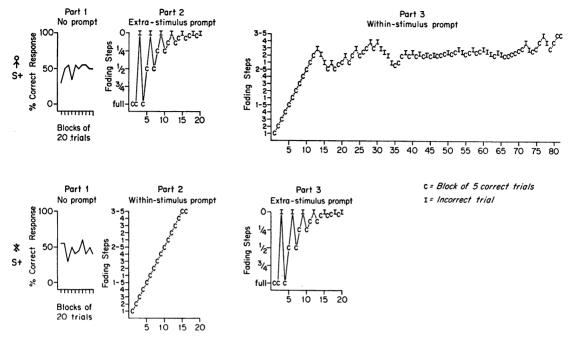


Fig. 6. Jeffrey's data on the visual discriminations. Data are plotted in same manner as in Figure 4.

prompt was presented on the first task (the stick figures), he was unable to transfer (Part 2, trial blocks 16 to 19). His subsequent acquisition of the task with the within-stimulus prompt (Part 3 in figure) was slow and marked by difficulty in progressing when the redundant component of the discrimination was being faded-in. The second task, the Xs with the dots, was learned errorlessly with the within-stimulus prompt (Part 2). When the extra-stimulus prompt procedure was then introduced (Part 3), the subject transferred to the pointing prompt, lost the discrimination, and was unable to regain it.

Jeffrey on auditory discriminations. Figure 7 shows Jeffrey's data on the auditory discriminations. One can see that the subject learned the first discrimination (nolä versus nolē) during the training with no prompt. When the extrastimulus prompt was introduced (Part 2), the subject made one error but immediately regained the discrimination. The second auditory task (magō versus magōō) proved to be much more difficult for this subject. He did not learn during the training with no prompt. During the extra-

stimulus prompt procedure (Part 2), he had a great deal of difficulty responding correctly, even at the full-prompt level, as is evidenced by the 26 trial blocks needed to achieve criterion for fading the prompt. The subject was subsequently unable to transfer to the training stimuli. Fading the within-stimulus prompt (Part 3) proved to be difficult, as evidenced by the many fading steps that had to be broken down into smaller gradations in order to produce transfer.

The data for two other subjects, Michael and Ruby, were very similar to the data just described and are not presented here. However, certain aspects of the performances of two other subjects, Kurt and Marni, are particularly interesting because they deviate from the general trend of results.

Kurt. Kurt's record provides the only instance where the within-stimulus prompt procedure was unsuccessful. This occurred on the visual task involving the Xs and the dots. He first failed to learn the task either without a prompt or with the extra-stimulus prompt. When the within-stimulus prompt condition was introduced, he

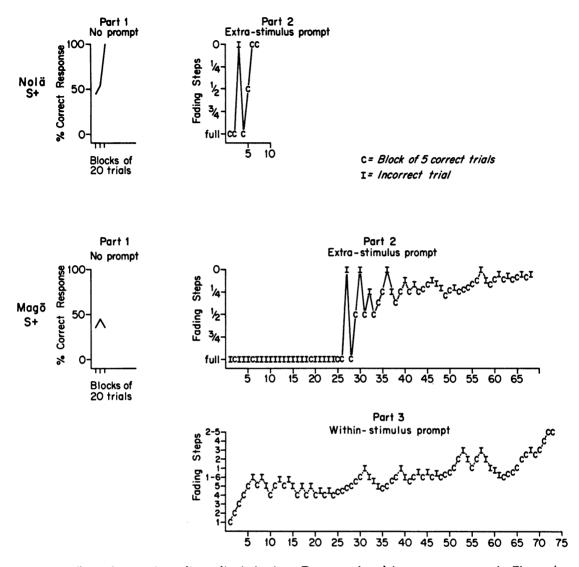


Fig. 7. Jeffrey's data on the auditory discriminations. Data are plotted in same manner as in Figure 4.

faded easily to the point where the relevant stimulus components (the dots) were of equal size (Phase 2, Step 5) but was unable to progress beyond this step. That is, whenever the tiniest pencil dot was placed between the black dots as the first step to fading in the redundant component, "X", the subject lost the discrimination. He was reliably unable to progress beyond this step even after 100 trials, and after the steps had been broken down into the smallest possible. Therefore, the subject did not acquire the discrimination. In contrast, the second visual task,

the stick figures, was learned without a prompt and was retained when the extra-stimulus prompt procedure was introduced.

Marni. Marni was behaviorally less retarded than the other subjects and, as might be expected, her data reflect this. She learned both visual discriminations and the second auditory discrimination (nolä versus nolē) without a prompt. She also retained these discriminations when the extra-stimulus prompt was introduced.

This subject, however, had difficulty with the first auditory task (magō versus magōō). She was

unable to learn the task without a prompt. The experimental procedure required that she first be trained with the extra-stimulus prompt (buzzer). Yet, after 780 full-prompt trials, she was still unable to reach criterion. The experimenter next presented the within-stimulus prompt condition and the subject acquired the discrimination easily. When the extra-stimulus prompt was again presented, the subject still did not reach criterion at the full-prompt level. The addition of the extra-stimulus prompt interfered with the discrimination, but the subject did not selectively respond to the prompt. After 20 trial blocks without learning at the full-prompt level, the experimenter instituted a different procedure to get the subject to respond to the prompt stimulus in this situation. Since the subject would respond to the prompt alone (as in the pretraining), the experimenter presented the prompt at its normal intensity (70 dB) and slowly faded in the verbal stimuli (S+ and S-) by gradually increasing the volume at which they were presented during the next 50 trials. The subject learned to respond correctly at the full-prompt level. When the prompt was removed for the first fading step, the subject retained the discrimination.

Effect of Fading in S-

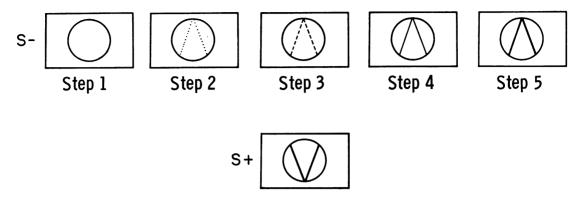
The result of fading-in the verbal stimuli to train Marni to respond to the buzzer prompt points to an interesting question about the results of this study. In that procedure, the S— stimuli (the verbal stimuli) were faded-in while the S+ stimulus (buzzer) remained unaltered. This is essentially the same procedure used in the within-stimulus prompt fading. However, the extrastimulus prompt fading procedure did not incorporate fading-in of S—. A further condition was thus employed to determine if the effectiveness of the within-stimulus prompt was due to the fading-in of the S— stimulus or due to the use of the relevant component as a prompt.

In this condition, an extra-stimulus procedure that incorporated fading-in of S— was compared with a within-stimulus procedure that did not utilize fading-in of S—. If fading-in of the S— stimulus was crucial to the success of the within-stimulus prompt, this extra-stimulus prompt procedure would be expected to be effective in teaching a new discrimination. Similarly, one would expect that the within-stimulus procedure that did not incorporate fading in of S— would not be successful.

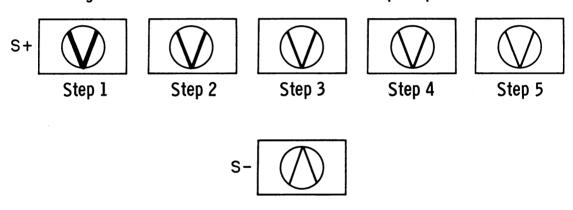
Two subjects, Jeffrey and Michael, were trained on a new visual discrimination. The S+ stimulus consisted of a circle containing a "V". The S— stimulus consisted of a circle containing an inverted "V". These stimuli and the fading steps used are presented in Figure 8. Both subjects received 60 trials on the task without a prompt. Both subjects failed to learn. They were then presented with the new extra-stimulus prompt condition. In this condition, the redundant component (0) was present on both S+ and S- cards from the beginning of training. The S+ relevant component (V) was presented at the full intensity, but instead of the S- relevant component (inverted V) appearing at the beginning of training, this component was gradually faded-in. The experimenter continued to point to the correct card during this training. The five pre-arranged steps used to fade-in the S— relevant component are shown in the top half of Figure 8. If the subject responded correctly on five consecutive trials on a fading level, he was advanced to the next level. If he erred. he was backed up to the previous step. After the subject responded correctly on 10 consecutive trials with both S+ and S- stimuli at full intensity, the extra-stimulus prompt was withdrawn in the same back-up fading procedure as before. It was found that this procedure was unsuccessful in producing transfer from the prompt to the training stimuli. There were no errors while fading-in the S- relevant component.

For the within-stimulus prompt, the relevant component (inverted V) was exaggerated on the S+ stimulus and gradually faded down toward the normal size. The S- relevant component (V) remained the normal size throughout the

A) Fading in S- with the extra-stimulus prompt



B) Fading down of S+ with the within-stimulus prompt



FADING STEPS FOR Ws. ODISCRIMINATION

Fig. 8. Task stimuli and fading steps for the control condition assessing effects of fading-in of S- stimulus.

procedure. Again, the redundant component was present on both S+ and S- stimuli from the beginning of training. As before, there were five pre-arranged fading steps that could be broken down when the subject had difficulty progressing.

This procedure was again successful in teaching the discrimination. One subject, Jeffrey, learned the discrimination without error using

this procedure. The other subject, Michael, had difficulty when the relevant component on S+ approached the normal size. With three added gradations of this last fading step, this subject also learned the task.

The results of this added condition indicate that the success of the within-stimulus prompt procedure cannot be attributed solely to the fading in of the S— stimulus.

DISCUSSION

The present findings can be summarized as follows: (1) The children usually failed to learn the discriminations without a prompt. (2) The children always failed to learn a previously unlearned discrimination when the extra-stimulus prompt was employed; they usually did learn when the within-stimulus prompt was employed. (3) These findings were independent of which modality (auditory or visual) was required for the discrimination.

The major purposes of this study were to assess the effectiveness of a "traditional" prompting technique (e.g., pointing) and to compare the effectiveness of one prompt procedure (within-stimulus) over another (extra-stimulus). The data show that the typical prompt procedure is ineffective with autistic children and support the inference that within-stimulus prompts are more successful than extra-stimulus procedures. It had been predicted that the withinstimulus prompt would be superior because it involved prompting within the relevant component of the training stimulus, and hence did not require the child to respond to multiple stimuli, as is required when a prompt stimulus not incorporated within the training stimulus is used. The findings are consistent with previous findings on stimulus overselectivity in autistic children (Lovaas et al., 1971; Lovaas and Schreibman, 1971; Koegel, 1971; Koegel and Wilhelm, 1973; Schreibman and Lovaas, 1973; Reynolds et al., 1974). This previous research indicates that when presented with a complex stimulus, autistic children typically respond to only one component of the complex. Since prompting procedures typically involve presenting the child with an added cue to guide his response, it seems likely that the autistic child would selectively respond to the added prompt and fail to learn about the training stimuli. In no instance was the extra-stimulus prompt successful in teaching a previously unlearned discrimination. On the other hand, the data show that using a relevant component of the discrimination as a

prompt led to learning, perhaps because it did not require the child to respond to multiple cues (prompt and training stimulus). However, since other procedural variables differentiate between the two prompt conditions, it is necessary to discuss other interpretations of these data.

One could argue that the difference in effectiveness of the two prompts was due to the different fading procedures used. The extra-stimulus prompt was faded in a back-up procedure and the within-stimulus prompt was faded in a progressive procedure. A back-up procedure was chosen for the extra-stimulus prompt because (1) it has been shown to be a very effective technique (Holland, 1961), and (2) it allows one to assess the largest or smallest fading step to which the subject is able to transfer correctly. In contrast, it was deemed undesirable to introduce the redundant component of the discrimination early in training with the within-stimulus prompt, since the purpose of the prompt was to ensure the subject's continued response to the relevant cue. Therefore, a progressive order of fading steps was chosen for the within-stimulus prompt condition.

One might also argue that the within-stimulus prompt procedure was more effective, because that procedure entailed fading the prompt in smaller increments than was possible for the extra-stimulus prompt. With the pointing prompt, the size of the smallest fading step was limited to the width of the experimenter's finger. But since this was the particular prompt under study, it was important to use it, even though its form limited the kind of fading steps and thus the neatness of the method. Similarly, the buzzer prompt became inaudible at a certain level and could not be faded any further. As a result of the differential number of possible fading steps, some subjects received considerably more trials with the within-stimulus prompt than with the extra-stimulus prompt. Thus, the possibility exists that the superiority of the within-stimulus procedure was due to the fact that some subjects received more training with this prompt. Also, it might be argued that because the extra-stimulus procedure produced more errors than did the within-stimulus prompt, this accounted for the differential effectiveness of the procedures.

While the above may be considered as viable interpretations, the primary objection to them lies in the important fact that introduction of the extra-stimulus prompt decreased performance. That is, even though a discrimination may have been mastered, using the within-stimulus prompt or no prompt, that discrimination was disrupted or completely lost in some cases, when an extrastimulus prompt was introduced. This finding supports the observation that the autistic children selectively respond to the prompt stimulus while "ignoring" the training stimulus. The main point here is that despite differences in number of trials or number of errors, the disruptive effects of the extra-stimulus prompt introduced after mastery with the within-stimulus prompt suggests that the procedural differences probably were not the determining factors in the outcome of this study.

It is also interesting to speculate why the manual prompt used in the first stage of training the children to respond was successful. Essentially, this can be seen as an extra-stimulus prompt because it involved an added stimulus. Possibly this form of prompt was effective because it incorporated the child's response with the prompt (as when the experimenter moved the child's hand to the card, or the bar). Perhaps it was effective because of the long history these children have of transferring from this particular prompt. Also, one might speculate that the extra- within-stimulus distinction is not important when teaching a motor response. No particular interpretation is suggested by the present data.

The goals of this investigation were to test the effectiveness of a traditional prompt and to compare its effectiveness with a within-stimulus prompt procedure for teaching autistic children. The results indicate that a within-stimulus prompt can be useful with these children and that extra-stimulus prompts, which are more commonly used, do not help, and may in fact interfere with learning. Thus, a teacher working with autistic children might use caution when setting up the child's learning environments. Realizing that these children operate under a very limited range of stimulus control, one would want to ensure that the environment is restricted, providing mainly, if not exclusively, those stimuli relevant to the task the child is learning. Extraneous stimuli, whether they be prompt or other environmental cues, may retard learning, because the child may respond to one of these irrelevant cues and not to the training stimuli.

From the data presented here, one can say that if a teacher uses an extra-stimulus prompt and a back-up fading procedure, an autistic child will probably fail to transfer from the prompt. In contrast, if the teacher uses a withinstimulus prompt and a progressive fading procedure, the child will probably transfer from the prompt to the training stimuli. Although further analysis and refinements will come from future research, the present results provide a major increase over what we have known before about prompts with autistic children. The data presented here represent the first analysis of the types of prompt procedures that are and are not effective in teaching these children.

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